Commonwealth of Kentucky
Division for Air Quality

PERMIT STATEMENT OF BASIS

TITLE V (DRAFT) NO. V-04-016
TRINITY MARINE PRODUCTS, INC.
700 TERRACE LANE, PADUCAH KY 42003
JANUARY 27, 2005
BRIAN BALLARD, REVIEWER
PLANT I.D. # 021-145-00040
APPLICATION LOG # 51525

TECHNICAL BACKGROUND

Gel coat and resin spray-up are commonly used in open molding processes in the fiber-reinforced plastics/composites (FRP/C) and boat building industries. Styrene, a compound listed as a hazardous air pollutant, is emitted during the application and post-application (roll-out and curing) stages. (EPA/600/SR-97/018)

During the gel coat and resin spray-up operations, polyester resins are atomized and projected onto a mold. Gel coat and resin materials contain styrene, which cross-links the resin molecules under the effects of a promoter and an initiator to form a solid polymer. An initiator such as methyl ethyl ketone peroxide (MEKP) is mixed with the resin material to initiate the cross-linking process. The initiator is mixed with resin material within the spray gun or application equipment (internal mixing) or just outside the spray tip (external mixing). Wet resin material cures on the mold. For resin lamination, a roll-out step follows the application step to remove air bubbles entrained in the laminate. During the application and post-application (i.e., rolling-out and curing) stages, excess styrene not cross-linked in polymerization is emitted from atomized resin particles and from wet laminate. (EPA/600/SR-97/018)

SOURCE DESCRIPTION:

Trinity Marine Products, Inc. is a fiberglass parts manufacturing plant involved primarily in the construction of barge and railcar covers. The production process takes place in a large open building with the molds arranged in a line the length of the building. The emissions escape through ventilation ports located on the side of the building near the bottom of the wall. The ventilation ports are equipped with fiber filter and screens. The production process takes place approximately 10 feet from any ventilation port.

Gel coat is sprayed into a mold and allowed to cure. The next step involves the spraying of a mixture of chopped fiberglass and resin onto the cured gel coat using the Venus chopper guns. There are eight (8) gel coat applicators and eleven (11) Venus chopper guns. Two (2) percent overspray is assumed for gelcoat sprayed into the mold. The Division will require testing or submittal of an engineering evaluation to determine the validity of particulate matter emission estimates.

The next step involves laying fiberglass woven roving which has been impregnated with polyester resin on top of the chopped fiberglass and rolling any air bubbles from between the layers. The entire part is then allowed to cure thoroughly before it is removed from the mold.

The impregnation of the woven fiberglass with polyester resin is accomplished automatically in an impregnator which passes the fiberglass from a roll, through a compartment containing resin, under a baffle and through a roller which removes the excess resin and returns it to the resin compartment. The resin is applied by a dipping process and is a non-atomized process. There are three (3) Venus impregnators or laminators. VOC emissions are uncontrolled.

The existing plant currently operates under the authority of operating permit O-88-042. This permit limits the following processing rates:

Gel coat	10.28 gallons/hour and 74,000 gallons/year
Resin	76.39 gallons/hour and 550,000 gallons/year
Acetone	13.89 gallons/hour and 100,000 gallons/year
Methylene Chloride	0.49 gallons/hour and 3,500 gallons/year
MEK Peroxide	2.50 gallons/hour and 18,000 gallons/year

The potential to emit from gel coat and resin spray-up operations were estimated using maximum throughput information for bulk resin, drum resin and gel coat submitted by Trinity Marine Products. Trinity Marine Products also supplied information on the resin or gel coat applicator types and the HAP content of the resin and gel coats used in those applicators. Emission Factors were calculated using equations from 40 CFR 63, Subpart WWWW, Table 1, "Equations to Calculate Organic HAP Emissions Factors For Specific Open Molding and Centrifugal Casting Process Streams." Emissions from No. 2 Fuel Oil fired space heaters were estimated using emission factors from AP-42, Table 1.3-2, "Criteria Pollutant Emission Factors for Uncontrolled Fuel Oil Combustion" and Table 1.3-4, "Emission Factors for Total Organic Compounds (TOC), Methane, and Nonmethane TOC (NMTOC) from Uncontrolled Fuel Oil Combustion." Emissions from liquid propane gas (LPG) fired space heaters were estimated using emission factors from AP-42, Table 1.5-2, "Emission Factors for LPG Combustion." Emission estimates from resin tanks supplied with the application were verified using USEPA Emission Factor and Inventory Group Tanks 4.0 software.

The source was originally constructed in 1973 by Pro Form, Incorporated. A no permit required letter was issued. In January, 1981, the source replaced the six existing gel coat applicators (spray guns) with six new gel coat applicators of the same identical type. At the time this was determined to not result in any increase in emissions. Based on Division policy, since this construction occurred prior to May 6, 1981, a construction permit was not required to be issued to this source. Additionally, since the replacement of the existing gel coat applicators with new identical gel coat applicators did not result in an emission increase equal to or exceeding the significance levels, PSD would not have been applicable. The company then constructed several acetone storage tanks and a construction permit C-86-072 was issued to the source. An operating permit O-85-042 was issued to the source to include those storage tanks. In 1993, a no permit required letter was issued to SynTechnics for the addition of three (3) new gel coat applicators. The company now has changed its name from SynTechnics to Trinity Marine Products, Incorporated.

Prevention of Significant Deterioration of Air Quality (PSD) regulation was considered not applicable, since the source was constructed prior to the effective date of this regulation.

Trinity Marine Products, Inc. is subject to the requirements under 40 CFR Part 63 Subpart WWWW, National Emissions Standards for Hazardous Air Pollutants, Reinforced Plastics Composites Production as of April 21, 2006. By complying with 40 CFR Part 63 Subpart WWWW, this source will comply with 401 KAR 50:012. Compliance with 401 KAR 50:012 in the time period after the issuance of this permit and before April 21, 2006 will be accomplished by the requirement that the source monitor and record VOC emissions to demonstrate that not more 225 tons of VOC emissions are emitted per rolling twelve month period.

SOURCE EMISSION UNITS

The following table identifies and describes each emissions unit, such as process units and control devices.

TABLE 1 – SOURCE EMISSION UNITS

Emission Units			
I.D. No.	**Description**	**Applicable Regulation**	**Air Pollution Control Devices**
1	Application of gel coat to mold. Impregnation of fiberglass with styrene-based polyester resin. Spray-up of resin impregnated chopped fiberglass onto mold. Four (4) Polyester Resin Storage Tanks.	401 KAR 63:020, Potentially Hazardous Matter or Toxic Substances, applies to the potentially hazardous matter and toxic substance emissions from affected facilities.	Dry particulate filters.
		401 KAR 59:010, Particulate Matter, applies to the particulate matter emissions from affected facilities constructed on or after July 2, 1975.	
		40 CFR Subpart WWWW, National Emission Standards for Hazardous Air Pollutants: Reinforced Plastic Composites Production shall become applicable on April 21, 2006.	
2	Fifteen (15) Space Heaters fired with No. 2 Distillate Fuel Oil.	None	None
Insignificant Emission Units			
I.A. No.	**Description**		
1	Three (3) Space Heaters fired with Liquid Propane Gas (LPG).	401 KAR 59:010, Particulate Matter, applies to the particulate matter emissions from affected facilities constructed on or after July 2, 1975.	None
2	Acetone Storage Tanks	None	None
3	Diesel Storage Tank	None	None
4	LPG Storage Tank	None	None

Definitions Specific to 40 CFR 63 Subpart WWWW:

Atomized Mechanical Application – application of resin or gel coat with spray equipment that separates the liquid into a fine mist. This fine mist may be created by forcing the liquid under high pressure through an elliptical orifice, bombarding a liquid stream with directed air jets, or a combination of these techniques.

Corrosion-resistant gel coat – a gel coat used on a product made with a corrosion-resistant resin that has a corrosion-resistant end-use application.

Gel Coat – a quick-setting resin used to improve surface appearance and/or performance of composites. It can be used to form the surface layer of any composites other than those used for molds in tooling operations.

Gel Coat Application – a process where either clear production, pigmented production, white/off-white or tooling gel coat is applied.

Operation – a specific process typically found at a reinforced plastic composites facility. Examples of operations are noncorrision – resistant manual resin application, corrosion – resistant mechanical resin application, pigmented gel coat application, mixing and HAP – containing materials storage.

Definitions Specific to 40 CFR 63 Subpart WWWW (Continued):

Process Stream – each individual combination of resin or gel coat, application technique, and control technique.

Mold – a cavity or matrix into or onto which the composite materials are placed and from which the product takes its form.

Neat Gel Coat – the resin as purchased from the supplier, but not including any inert fillers.

Neat Gel Coat Plus – neat gel coat plus any organic HAP-containing materials that are added to the gel coat by the supplier or the facility, excluding catalysts and promoters. Neat gel coat plus does include any additions of styrene or methyl methacrylate monomer in any form, including catalysts and promoters.

Neat Resin – the resin as purchased from the supplier, but not including any inert fillers.

Neat Resin Plus – the neat resin plus any organic HAP-containing materials that are added to resin by the supplier or the facility. Neat resin plus does not include any added filler, reinforcements, catalysts, or promoters. Neat resin does include any additions of styrene or methyl methacrylate monomer in any form, including in catalysts and promoters.

Nonatomized Mechanical Application – the use of application tools other than brushes to apply resin and gel coat where the application tool has documentation provided by its manufacturer or user that this design of the application tool has been organic HAP emissions tested, and the test results showed that use of this application tool results in organic HAP emissions that are no greater than the organic HAP emissions predicted by the applicable nonatomized application equation(s) in Table 1 of 40 CFR 63 Subpart WWWW. In addition, the device must be operated according to the manufacturer's directions, including instructions to prevent the operation of the device at excessive spray pressures. Examples of nonatomized application include flow coaters, pressure fed rollers, and fluid impingement spray guns.

Open Molding – a process for fabricating composites in a way that HAP-containing materials are exposed to the atmosphere. Open molding includes processes such as manual resin application, mechanical resin application, filament application, and gel coat application. Open molding also includes application of resin and gel coats to parts that have been removed from the open mold.

Tooling Gel Coat – a gel coat that is used to form the surface layer of molds. Tooling gel coats generally have high heat distortion temperatures, low shrinkage, high barcol hardness, and high dimensional stability.

Tooling Resin – a resin that is used to produce molds. Tooling resins generally have high heat distortion temperatures, low shrinkage, high barcol hardness, and high dimensional stability.

All composite fabricating processes at Trinity Marine Products are open molding processes. The specific open molding process types at Trinity Marine Products are atomized mechanical resin

application, non-atomized mechanical resin application, and atomized spray gel coat application. The following emission limits will apply for these processes:

TABLE 2 – 40 CFR 63 SUBPART WWWW EMISSION LIMITS

Operation Type	HAP Emission Limit	Emission Factor for materials with 33% or more HAP Content Compliance Demonstration Equation	Emission Factor for materials with less than 33 % HAP Content Compliance Demonstration Equation
Atomized Mechanical Resin Application	87 lb/ton	EF = ((0.714 x %HAP) - 0.18) x 2000	EF = 0.169 x %HAP x 2000
Atomized Mechanical Resin Application (CR/HS)	112 lb/ton	EF = ((0.714 x %HAP) - 0.18) x 2000	EF = 0.169 x %HAP x 2000
Tooling Atomized Mechanical Resin Application	254 lb/ton	EF = ((0.714 x %HAP) - 0.18) x 2000	EF = 0.169 x %HAP x 2000
Non-Atomized Mechanical Resin Application	87 lb/ton	EF = ((0.157 x %HAP) - 0.0165) x 2000	EF = 0.107 x %HAP x 2000
Non -Atomized Mechanical Resin Application (CR/HS)	112 lb/ton	EF = ((0.157 x %HAP) - 0.0165) x 2000	EF = 0.107 x %HAP x 2000
Tooling Non - Atomized Mechanical Resin Application	254 lb/ton	EF = ((0.157 x %HAP) - 0.0165) x 2000	EF = 0.107 x %HAP x 2000
Atomized Spray Gel Coat Application	377 lb/ton	EF = ((1.03646 x %HAP) - 0.195) x 2000	EF = 0.446 x %HAP x 2000
Tooling Gel Coat Application	437 lb/ton	EF = ((1.03646 x %HAP) - 0.195) x 2000	EF = 0.446 x %HAP x 2000
(CR/HS) or High Performance Gel Coat Application	605 lb/ton	EF = ((1.03646 x %HAP) - 0.195) x 2000	EF = 0.446 x %HAP x 2000

The organic HAP emissions limits for open molding are expressed as lb/ton and are listed in Column 2 of Table 2. The permittee must be at or below these values based on a 12-month rolling average. A compliant resin or gel coat means that if its organic HAP content is used to calculate an organic HAP emissions factor, the factor calculated does not exceed the appropriate organic HAP emissions limit shown in Table 2.

APPLICABLE REGULATIONS:

401 KAR 50:012 – Major Contaminant Source.
401 KAR 63:020 – Potentially Hazardous Matter or Toxic Substances, applies to the potentially hazardous matter and toxic substance emissions from affected facilities.
401 KAR 59:010, Particulate Matter, applies to the particulate matter emissions from affected facilities constructed on or after July 2, 1975.
40 CFR, Subpart WWWW – National Emission Standards for Hazardous Air Pollutants: Reinforced Plastic Composites Production, shall be come applicable on April 21, 2006.

COMMENTS:

TOXICS MODELING

ISCST3 Inputs and Results

The production building and receptor network are centered at UTM vertical (KM) 367205.6 and UTM horizontal (KM) 4097755.4. The receptor network is a polar grid with a radius of ten kilometers. Arcview is used to retrieve an image of the area. The image is positioned at the center of the receptor network on the appropriate coordinates and is used to estimate the plant boundaries. The appropriate terrain data is imported to the file to give elevations. The model is run using meteorological data from the Paducah Meteorological station for the year 1994 and Paducah/Salem Meteorological Station for the years 1985 and 1986. The model showed that the highest concentrations of styrene would be at or near the plant boundaries. The highest concentrations were obtained using 1986 Meteorological data.

The main production building is 270' long (in the East – West direction) by 102' wide (in the North – South direction). The building has a gable roof design. At the inside eave ceiling it is 20' high on each side and at the center it is 24' high.

There are exhausts on three sides of this building as follows:

On the South Side, with locations measured from West to East from the SW corner of the building: @ 37' 2" with Ht = 13"; @ 82' 3" with Ht = 12"; @ 118' 8" with Ht = 8"; @ 140' 8" with Ht = 10"; @ 166' 8" with Ht = 7"; 189' 0" with Ht = 14' 6"; @ 221' 8" with Ht = 14' 6".

One (1) only on the West Side, with location measured from South to North from the SE corner of the building: @ 11' 0" with Ht = 12".

On the North Side, with locations measured from West to East from the NW corner of the building: @ 37' 5" with Ht = 20'; @ 65' 0" with Ht = 20'; @ 79' with Ht = 20'; @ 94' 6" with Ht = 20'; @ 101' 6" with Ht = 20'; @ 126' 0" with Ht = 20'; @ 135' 8" with Ht = 9' 4"; @ 163' 8" with Ht = 9' 4"; @ 185' 8" with Ht = 9' 4"; @ 225' 0" with Ht = 1' 4"; @ 255' 3" with Ht = 1' 2".

Each exhaust is 30" in diameter. The information above is used to estimate an average exhaust height of 2.96 meters. Considering the building footer, the average release height is estimated at 3.96 meters.

The building is modeled as a volume source. The initial lateral dimension is calculated as σ_{y0} = (82.3)/4.3 = 19.14 meters. The initial vertical dimension is calculated as σ_{z0} = (6.71)/2.15 = 3.12 meters.

The emission rate is based on the maximum hourly processing rate of bulk resin. The assumptions are a bulk resin density of 9.17 pounds per gallon and a styrene content of 44 percent. Referenced from 40 CFR 63 Subpart WWWW, the emission factor for nonatomized mechanical nonvapor-suppressed resin application with styrene content greater than 33 percent is

EF = ((0.157 x %HAP) – 0.0165) x 2000

TOXICS MODELING (CONTINUED**)**

The emission factor with a styrene content of 44 percent is calculated to be 105.16 pounds of styrene emitted per ton of resin processed.

The table below shows property line concentrations at varying emission rates.

Maximum processing rate of bulk resin (gallons/hour)	Tons resin/hour	Styrene emitted (grams/second)	Modeled 1-hour concentration ($\mu g/m^3$)
123.46	0.566	7.50	20,856
142.85	0.655	8.68	24,137
171.42	0.786	10.41	28,948

The acute reference exposure limit (REL) for styrene is 21,000 $\mu g/m^3$ referenced from http://www.epa.gov/ttn/atw/toxsource/table2.pdf.

Based on these results, the Division will require the source to perform a Risk Assessment for styrene emissions. The Risk Assessment shall be submitted within 180 days of the issuance of the final permit. The Risk Assessment will be evaluated by the Department of Environmental Services (DES), Risk Assessment Section. The Division will determine if further action is required by the source upon receiving the recommendations of DES, Risk Assessment Section.

PERIODIC MONITORING:

The Permittee shall maintain monthly records of the purchase and usage of resin, gel coats or any VOC containing material. VOC emissions shall be calculated and recorded on a monthly basis. These records shall be summarized in tons per month VOC emissions; subsequently, tons of VOC emissions per rolling 12-month period shall be recorded. These records, as well as purchase orders and invoices for all VOC containing materials, shall be maintained on site for a period of five years from the date the data was collected and shall be provided to the Division upon request.

The permittee shall comply with all monitoring requirements specified by 40 CFR 63 Subpart WWWW that all apply by the compliance date, April 21, 2006.

EMISSION AND OPERATING CAPS DESCRIPTION:

225 tons of VOC per rolling 12-month average.

OPERATIONAL FLEXIBILITY:

NA

CREDIBLE EVIDENCE:

This permit contains provisions which require that specific test methods, monitoring or recordkeeping be used as a demonstration of compliance with permit limits. On February 24, 1997, the U.S. EPA promulgated revisions to the following federal regulations: 40 CFR Part 51, Sec. 51.212; 40 CFR Part 52, Sec. 52.12; 40 CFR Part 52, Sec. 52.30; 40 CFR Part 60, Sec. 60.11 and 40

CFR Part 61, Sec. 61.12, that allow the use of credible evidence to establish compliance with applicable requirements. At the issuance of this permit, Kentucky has not incorporated these provisions in its air quality regulations.